

**REMARKS**

The Office Action of June 30, 2010, and the references cited therein have been carefully considered. The restriction requirement and withdrawal of claims 7-12 from further consideration in this application have been noted.

In this Amendment, claims 1, 3 and 4 have been cancelled and replaced by a new independent claim 13, which incorporates all of the limitations of these claims but more specifically defines the structural relationships involved and positively recites the semiconductor terminal lead soldered in the aperture. Additionally, the dependency of claims 2, 5 and 6 has been changed so that these claims now properly depend from claim 13, and a new claim 14 dependent on claim 13 has been added to define a further characteristic of the invention. The claim amendments simply clarify the previously claimed and argued features of the invention, and raise no new issues requiring further search and/or consideration. Accordingly, entry of the Amendment is respectfully requested.

The objection to claims 1-6 has been noted. In view of the cancellation of claim 1 and the substitution therefore of claim 13, which does not contain the objected too language, it is submitted that this ground of objection is now moot and should be withdrawn.

The rejection of claims 1-6 (now claims 2, 5, 6 and 13) under 35 U.S.C. 103 as being unpatentable over Applicants admitted prior art figure 1 (APa1) in view of the patent to Suzuki has been noted and is respectfully traversed. In rejecting the claims, the Examiner has taken the position that the APa1 discloses all of the features recited in claim 1, 3 and 4 (now claim 13) other than that the aperture is a conical bore that is approximately perpendicular to the surface planes of the bus bar, that the apex of the conical bore is oriented toward a first surface plane of the bar, that the bore terminates in a circular aperture, whose diameter is slightly greater than the diameter of the terminal lead, at the second surface plane, and that the cone angle of the conical bore is at least 30°; that the Suzuki patent in Fig. 1 shows a soldering arrangement or nest

having all of the features not taught by APA1; and that consequently it would be obvious to one skilled in the art to replace the soldering arrangement of APA1 with the soldering arrangement of Susuki in order to provide a better solder connection, and arrive at the invention defined in claim 1. This conclusion by the Examiner is respectfully traversed. Moreover, it is submitted that even if the teachings of the two references were combined in the manner suggested by the Examiner would not result in the invention defined in original claim 1 and certainly not in claim 13.

The present invention as defined in claim 13 is directed to a soldering arrangement or nest provided in a solid metal bus bar, whereby the heat dissipation is improved during soldering so that the semiconductor device whose lead is soldered is not damaged by the heat applied during soldering. For this purpose, and as recited in claim 13, an aperture is formed in a solid bus bar, with the aperture having a conical shape with a cone angle of at least 30°, and with the conical aperture being oriented substantially perpendicular to the two flat parallel surface planes of the solid bus bar formed entirely of a good heat and electrically conductive metal. The aperture is disposed between and extends to the two parallel surface planes of the solid uniform thickness bus bar as clearly shown in the drawings. As a result, all surfaces of the conical bore or aperture are surrounded only by the good heat conducting material of the bus bar so that the improved soldering connections result as discussed in detail in the present application and in the "Remarks" sections of the previous Amendments. Note that the reasons for the minimum angle for the conical aperture are not to permit a greater quantity of solder to be added, which is **not** a problem with a solid bus bar, but rather to increase the surface area in a particular manner for heat dissipation purposes. The differences in the heat dissipation problems of bus bars and lead frames are discussed in greater detail in the Remarks in the Amendment filed August 11, 2008, which are incorporated herein by reference. Moreover, as more clearly recited in claim 13 (and as generally recited in prior claim 1), the lead or terminal of the semiconductor device is inserted into the aperture via the smaller circular opening, so that the semiconductor device faces the bus bar surface containing the smaller circular opening or apex of the aperture, and extends through the aperture to the larger circular opening

at the opposite parallel planar side of the bus bar, so that at most a small gap is provided between the terminal and lead and the smaller circular opening. This combination of features is not taught or made obvious by any combination of the teachings of APa1 or Suzuki.

APa1 simply shows that it is known in the art to provide a solid bus bar of a good conducting metal with a cylindrical aperture into which a terminal lead of a semiconductor lead is soldered. The Suzuki patent is **not** concerned with solder connections to a bus bar but rather to a lead frame 1 as described in column 1, lines 27-35, which frame is sandwiched between resin layers or plates 2 and 3. The actual conical aperture is formed in a burring portion 4 that is part of the lead frame and projects downwardly and penetrates the resin layer 3. The portion 4 is neither disposed between nor extends to any opposed pair of parallel planar surfaces as required by claim 13, particularly since no such opposed parallel surface planes are present in the lead frame arrangement of Suzuki. Accordingly, since the present invention and the APa1 are directed to a soldering arrangement for a solid bus bar while the Suzuki patent is directed to a soldering arrangement for a lead frame, and since the soldering problems, including heat dissipation mechanisms, between bus bars and lead frames are entirely different, it is submitted that one skilled in the art would not consider forming the cylindrical aperture or bore of APa1 as a conical bore as suggested by the Examiner. Moreover, even if the combination were made, the teaching of Suzuki is that the lead be inserted into the aperture via the larger circular opening, whereby the semiconductor device faces the base of the conical aperture as is clearly shown in Fig. 1 of Suzuki. This is completely contrary to the present invention as recited in claim 13 (and claim 1). Accordingly, it is submitted that claim 13 and claims 2, 5 and 6 dependent thereon, are allowable over the combination of the APa1 and Suzuki references.

Reconsideration of the rejection of claims 1-6 (now claims 2, 5 and 13) under 35 U.S.C. §103(a) as being unpatentable over the patent to Lynch (U.S. 4,001,490) in view of the patent to Steigerwalt et al. (U.S. 2,912,745) is respectfully requested.

As in the previous rejection, the patent to Lynch is directed to providing a solder connection for a bus bar, while the Steigerwalt patent is directed to providing a solder connect in a lead frame wherein the problems of heat dissipation and the heat dissipation mechanism are quite different than those involved with a bus bar as discussed above. Accordingly one skilled in the art would not consider combining same in the manner suggested by the Examiner, particularly since the teachings of the two patents are incompatible. First of all, It is again pointed out that the Lynch patent is not concerned with soldering a bus bar to a lead or terminal of a semiconductor component lead wherein rapid heat dissipation to avoid damaging the component is a problem. Rather, the Lynch patent is concerned with soldering a bus bar (10) to a substantially large area self supporting terminal post (20) extending vertically from a circuit board, a situation in which heat dissipation is not a problem. To make the connections to the terminal (20) according to the Lynch patent, the bus bar (10) according to FIG. 6 is twisted adjacent the apertures (15) to produce or form an interference or force fit within the aperture (15) between the bus bar (10) and the terminal post (20) as shown, for example, in FIGS. 3 and 4 of Lynch and described, for example, in column 5, lines 26-48. Note that as a result of the twisting of the bus bar of Lynch, there is no bus bar with two opposed parallel planar surfaces, as required by claim 13. Moreover, the interference fit between the bus bar aperture (15) and the terminal post (20) of Lynch, creates a very small gap around portions of the post (20); and this small, uneven gap is required to hold the bus bar in place during heating and soldering. **Such a connection or interference fit as required with the Lynch arrangement would not be possible if a conical bore through the bus bar is substituted for the rectangular bore (15) of Lynch**, as suggested in the Office Action, because the expanding diameter of the conical bore would not permit holding or gripping of the bus bar in a force or interference fit as required by the teachings of Lynch. Accordingly, for this additional reason one skilled in the art would not consider providing the bus bar of Lynch with a conical bore.

Additionally, according to Lynch, the solder is applied by a solder layer (11) applied to one outer surface of the bus bar (10). To make the solder connection, the

entire bus bar (10) is heated, and the solder (11) will flow, due to the contact or interference fit between the terminal post (20) and the bus bar (10), within the small gap around the post (20) in the aperture (15). However, if the aperture (15) were conical and oriented as suggested by the Examiner, there would be **no contact** between the terminal post (20) and the solder layer (11) on the surface of the bus bar, and thus no solder flow. Consequently, for this additional reason, one skilled in the art would not consider combining the teachings of Lynch and Steigerwalt.

Moreover, Steigerwalt does not teach a conical bore for a bus bar or any conical bore or aperture at all. Rather, the Steigerwalt patent teaches that the thin sheet of metal or lead frame forming a printed circuit is bent to provide a metalized conical depression surrounding the punched hole for receiving the component terminal in order to supply additional bonding area for the solder to enable dip soldering. The conical depression of Steigerwalt is **not** an aperture extending through a metal plate with opposed parallel sides as required by claim 13. Moreover, heat dissipation is not a concern with the Steigerwalt arrangement; and there is no teaching that this arrangement would have any advantage, except in the case of dip soldering of circuit boards. There clearly is no teaching that the conical shape would have any benefit in a solid bus bar not used with dip soldering or where large surface areas are readily available.

Claim 1 further recites that the conical aperture is located entirely between and extends to the two parallel outer planar surfaces of the bus bar. Such is clearly not the case in either Lynch or Steigerwalt.

. Accordingly, for the above-stated reasons, it is submitted that claim 13, and claims 2, 5 and 6 dependent thereon, are allowable over the combination of the Lynch and Steigerwalt patents under 35 U.S.C. §103(a).

Newly added claim 14 is dependent on claim 13 and recites that the surface of the conical aperture between the two opposed planar surfaces is substantially larger than the surface of the terminal lead between the two planar surfaces. Support for this

claim is found on page 5, lines 21-25. Accordingly, it is submitted that this claim is allowable for at least the same reasons as stated above with regard to claim 13.

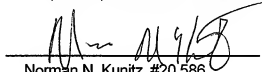
In view of the above amendments and for the above-stated reasons, it is submitted that claim 13, and claims 2, 5, 6 and 14 dependent thereon, are allowable over the prior art of record and are in condition for allowance. Such action and the passage of this application to issue are, therefore, respectfully requested. It is noted that counterpart applications have been allowed in at least the European and Japanese Patent Offices.

If the Examiner is of the opinion that prosecution of this application would be advanced by a personal interview, he is invited to telephone undersigned counsel to arrange for such an interview.

Respectfully submitted,

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